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EXAMINER

WHITESSELL GORDON, STEVEN H

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/570,726	Applicant(s) CORMONT ET AL.	
	Examiner Steven Hunt Whitesell-Gordon	Art Unit 2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☒ Claim(s) 2-7, 8-11 and 15-17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>6/5/2006, 6/13/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- a. In claim 1, lines 22-23, it is unclear what quantity of energy is being determined in order to reach another quantity of energy. For examining purposes, the latter recited quantity of energy is understood to be the quantity of energy recited in step c) of claim 1.
- b. In claim 1, line 29, it is unclear what meant by the next current point. For examining purposes, current point was understood to be the next iterative step.
- c. In claim 4, lines 5, 8 and 11, it is unclear what the k_1 , k_2 and k_q represent. For examining purposes, the k_1 , k_2 and k_q were understood to represent constants associated with a particular laser chosen to determine a time delay.
- d. In claim 8, line 26, it is unclear whether the n th pulse recited pertains to the current n th pulse in line 19 of claim 8 or the next n th pulse in line 22 of claim 8. For examining purposes, said n th pulse was understood to be next n th pulse.

Therefore, Claims 1, 4 and 8 and claims depending therefrom (claims 2, 3, 5-7 and 9-17) are rejected as being indefinite. Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 1, 8 and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki [US 6,222,615] in view of Weulersse et al. [WO 02/27872].

For claim 1, Suzuki teaches an ultraviolet photolithography method in which: an object W to be lithographed possesses a plane surface, placed orthogonally to the light radiation 1 (see Fig. 1) and having a photosensitive zone (photosensitive substrate, see col. 3 line 6), this object being able to be moved transversely to this radiation (scanning direction of wafer, see Fig. 1);

the radiation carrying out the etching operation includes at least one line in the ultraviolet and consists of N successive current pulses (see col. 3 lines 13-17) whose energy per unit area through an irradiation window is measured (measurement system, see col. 3 lines 27-36);

this method comprising the following iterative steps, stated for an nth iteration:

a) integration of the energy per unit area of extreme ultraviolet radiation that has passed through the irradiation window during the N-1 last pulses (see col. 4 lines 16-19 and col. 10 lines 60-67 and Fig. 5);

b) during the time interval separating two successive radiation pulses, translation of the photosensitive object through a distance equal to a fraction $1/N$ of the width of the irradiation window along the axis of this translation (see col. 9 line 60 – col. 10 line 8);

c) subtraction of the integral obtained in step a) from the quantity of energy needed for the photoetching process (quantity is known, pulse energy dose is changed to meet known incremental values, see col. 10 lines 60-67 and Fig. 5) ;

d) determination of the quantity of energy remaining to be provided in order to reach this quantity of energy (see col. 11 lines 1-10 and Fig. 5);

e) calculation of the number of pulse quanta remaining to be generated for an n th pulse (the appropriate energy is known and each exposure pulse dose is changed so that the exposure is meeting the appropriate incremental exposure pulse energy, see col. 11 lines 1-10 and Figs. 5 and 6);

f) determination of the corresponding applied voltage whose number is equal to the integer part of this number (see col. 11 lines 6-11); and

g) applying voltage to emit laser (see col. 11 line 11), these steps a) to g) being repeated for the next current point (see col. 10 line 57 - col. 11 line 41).

Suzuki does not appear to teach the radiation pulses are extreme ultra violet radiation that are produced by the impact, on a suitable target, of at least two laser beams output by pulsed laser sources chosen from a plurality thereof, each emitting at each triggering a quantum of energy of given duration, these laser sources being focused at the same point on the target, and the corresponding step that are specific to the generation of an extreme ultraviolet pulse, specifically claimed step f, determination

Art Unit: 2851

of the corresponding applied voltage number of laser sources to be fired and selection of laser sources and claimed step g, synchronous triggering of the lasers selected at step f) .

Weulersse teaches extreme ultraviolet radiation pulses are produced by the impact, on a suitable target, of at least two laser beams output by pulsed laser sources chosen from a plurality thereof (see page 11 lines 32-36), each emitting at each triggering a quantum of energy of given duration (pulse time, see page 11 lines 32-36), these laser sources being focused at the same point on the target (see page 11 lines 32-36).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the extreme ultraviolet radiation system as taught by Weulersse in the exposure method taught by Suzuki, because the extreme ultraviolet system allows for a radiation wavelength between 8 nm to 25 nm, further allowing for a reduction in the size of features exposed on a substrate.

Weulersse also teaches synchronous triggering of the a selected number of laser sources to be fired and selection of laser sources (the case being lasers 2, 4 and 6 are fired in order to provide a specific pulse quanta calculated, see page 14 lines 6-9 and page 15 lines 31-36).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the control steps of the extreme ultraviolet radiation system as taught by Weulersse in the extreme ultraviolet exposure method taught by Suzuki in view of Weulersse above, in order to provide control of the lasers providing

the extreme ultraviolet radiation allowing for reduction in the size of features exposed on a substrate.

For claim 8, Suzuki teaches an ultraviolet photolithography device comprising: a source of ultraviolet radiation, an irradiation window of chosen width (see Fig. 1), interposed between the radiation source and the object and stationary relative to the radiation source (see Fig. 1); and means for the transverse displacement, relative to the window, of an object to be photolithographed that has a plane surface, orthogonal to the radiation (scanning direction of wafer, see Fig. 1), and has a photosensitive zone (photosensitive substrate, see col. 3 line 6), said displacement being chosen so that, between two successive pulses of ultraviolet radiation, the transverse displacement of the object relative to the window is a fraction $1/N$ of the width of the irradiation window in the direction of the displacement (see col. 9 line 60 – col. 10 line 8), in such a way that any one band of said zone of the object is exposed to a predetermined number N of successive pulses in the ultraviolet (see col. 3 lines 13-17), wherein the ultraviolet photolithography device comprises: means for measuring the energy per unit area of the radiation through the irradiation window (measurement system, see col. 3 lines 27-36); means for calculating, for the current n th pulse to be delivered: the sum of the measured energy of the ultraviolet radiation of the $N-1$ last pulses (see col. 4 lines 16-19 and col. 10 lines 60-67 and Fig. 5), the quantity of energy remaining to be delivered by the next n th pulse, by comparing said sum with a predetermined total energy dose needed for the photoetching (quantity is known, pulse energy dose is changed to meet known incremental values, see col. 10 lines 60-67 and Fig. 5), and the applied voltage

Art Unit: 2851

to deliver in order to obtain said quantity of energy of said nth pulse (see col. 11 lines 6-11); and wherein the means for displacing the object to be photoetched relative to the radiation are active, so as subsequently to displace the object by an increment equivalent to said fraction $1/N$ of the width of the window (see col. 11 lines 6-11).

Suzuki does not appear to explicitly teach a source of extreme ultraviolet radiation, comprising at least two laser beams output by pulsed laser sources, each emitting a quantum of energy of given duration (Δt) during a laser shot and capable of exciting one and the same region of a target that is able to emit a plasma possessing an emission line in the extreme ultraviolet or and means for selecting and controlling, synchronously, a chosen number of lasers according to the calculated number of quanta.

Weulersse teaches a source of extreme ultraviolet radiation, comprising at least two laser beams output by pulsed laser sources (see page 11 lines 32-36), each emitting a quantum of energy of given duration (Δt) during a laser shot pulse time, see page 11 lines 32-36) and capable of exciting one and the same region of a target that is able to emit a plasma possessing an emission line in the extreme ultraviolet (see page 11 lines 32-36)

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the extreme ultraviolet radiation system as taught by Weulersse in the exposure apparatus taught by Suzuki, because the extreme ultraviolet system allows for a radiation wavelength between 8 nm to 25 nm, further allowing for a reduction in the size of features exposed on a substrate.

Weulersse also teaches selecting and controlling the synchronous triggering of the a selected number of laser sources to be fired and selection of laser sources (the case being lasers 2, 4 and 6 are fired in order to provide a specific pulse quanta calculated, see page 14 lines 6-9 and page 15 lines 31-36).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the control steps of the extreme ultraviolet radiation system as taught by Weulersse in the extreme ultraviolet exposure apparatus taught by Suzuki in view of Weulersse above, in order to provide control of the lasers providing the extreme ultraviolet radiation allowing for a reduction in the size of features exposed on a substrate.

For claims 12-14, Suzuki in view of Weulersse as applied to claim 8 above teaches as extreme ultraviolet apparatus comprising at least two laser beams output by pulsed laser sources capable of exciting one and the same region of a target that is able to emit a plasma possessing an emission line in the extreme ultraviolet. Suzuki in view of Weulersse as applied to claim 8 above does not explicitly discuss a directed jet of particles comprising xenon and/or water microdroplets in the form of a mist where the laser shots are output by pulsed solid-state lasers operating as oscillators and pumped by continuously operating diodes.

Weulersse teaches the target is a directed jet of particles comprising xenon and/or water microdroplets in the form of a mist (see page 12 lines 8-13) where the laser shots are output by pulsed solid-state lasers operating as oscillators and pumped by continuously operating diodes (see page 12 lines 21-31).

It would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to incorporate the teaches xenon and/or water microdroplets in the form of a mist where the laser shots are output by pulsed solid-state lasers operating as oscillators and pumped by continuously operating diodes as taught by Weulersse in the extreme ultraviolet apparatus as taught by Suzuki in view of Weulersse as applied to claim 8 above, because this would provided a means for generating EUV that could provide for a reduction in the size of features exposed on a substrate.

Allowable Subject Matter

5. Claims 2-7, 9-11 and 15-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter: the number of laser sources calculated at step f) is fractional and the quantity of energy less than one quantum, associated with this fractional part of the number of lasers, is provided by a laser source and is triggered with a delay, of less than the duration of a quantum (re claims 9-11), relative to the instant of synchronous triggering of the other laser sources that deliver the integer part of the number of quanta of the same current pulse (re claims 2-7, 15 and 17). The selection means are designed to trigger a remaining number of lasers not contributing to the emission of an extreme

Art Unit: 2851

ultraviolet pulse, separately, so that the separate shots, output by these lasers, are not sufficient to emit an extreme ultraviolet pulse (re claim 16).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven Hunt Whitesell-Gordon whose telephone number is (571)270-3942. The examiner can normally be reached on Monday to Thursday, 9:00 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)? If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SHW/

7/28/2008

/Diane I Lee/

Supervisory Patent Examiner, Art Unit 2851